Nuclear shadowing in deep inelastic scattering on nuclei: leading twist versus eikonal approaches

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We use several diverse parameterizations of diffractive parton distributions, extracted in leading twist QCD analyses of the HERA diffractive deep inelastic scattering (DIS) data, to make predictions for leading twist nuclear shadowing of nuclear quark and gluon distributions in DIS on nuclei. We find that the HERA diffractive data are sufficiently precise to allow us to predict large nuclear shadowing for gluons and quarks, unambiguously. We performed detailed studies of nuclear shadowing for up and charm sea quarks and gluons within several scenarios of shadowing and diffractive slopes, as well as at central impact parameters. We compare these leading twist results with those obtained from the eikonal approach to nuclear shadowing (which is based on a very different space-time picture) and observe sharply contrasting predictions for the size and Q^2-dependence of nuclear shadowing. The most striking differences arise for the interaction of small dipoles with nuclei, in particular for the longitudinal structure function F_L^A.